

CLAIMS

1. A diagnostic device (10, 100, 200, 300) for pathologies of tubular anatomical structures comprising:
 - a tubular elongated structure (12, 28; 102, 126; 202, 218; 5 302, 304) developing between a proximal end and a distal end and being adapted to be inserted in the tubular anatomical structure,
 - means (22; 138; 230; 308) for locally dilating the walls of the tubular anatomical structure being associated with the 10 distal end of said elongated structure, said means for locally dilating being movable between a closed position for the introduction of the device and at least one open position for the viewing and evaluation of the pathology,
 - control means being associated to the proximal end of the 15 elongated structure, said control means being operatively connected to said means for locally dilating in order to move them between the closed position and the open position, and vice versa.
2. The diagnostic device according to claim 1, further 20 comprising means of viewing adapted to be associated with the elongated tubular structure and reach the tract of the tubular anatomical structure dilated by the means of dilating.

3. The diagnostic device according to claim 2, wherein the elongated tubular structure is internally hollow in order to receive the means of viewing.

4. The diagnostic device according to any preceding claims, wherein said means for locally dilating comprise petals (138; 230; 308) being arranged such that one first end thereof is associated to the distal end of the elongated tubular structure, said petals being adapted to assume at least one closed configuration and one open configuration.

5. The diagnostic device according to claim 4, wherein a petal (138; 230) comprises an arm (140; 232) which broadens into a curved surface (142; 234).

6. The diagnostic device according to claim 5, wherein said curved surface (142; 234) has an asymmetric conformation with respect to the respective arm (140; 232).

7. The diagnostic device according to claim 6, wherein said curved surface (142; 234) comprises a side extension (148; 242) suitable to overlap to the adjacent petal at least in the closed configuration of the petals.

8. The diagnostic device according to the claims 4 to 7, wherein a petal (138; 230; 308) comprises at least one detection element or marker (150; 244; 316).

9. The diagnostic device according to one of claims 4 to 8, further comprising a membrane (152; 246) being externally arranged on the petals (138; 230; 308).

10. The diagnostic device according to claim 9, wherein 5 said membrane (152; 246) is made in an elastic material.

11. The diagnostic device according to claim 9 or 10, wherein said membrane (152; 246) is made in a transparent material.

12. The diagnostic device according to one of claims 4 to 10, 11, wherein said elongated structure comprises an inner tube (12; 102; 202; 302) and an outer tube (28; 126; 218; 304) adapted to internally receive said inner tube, said inner tube and said outer tube being suitable to translate relatively to each other to open or close said petals (138; 15 230; 308).

13. The diagnostic device according to claim 12, wherein an outer surface of the outer tube (28; 126; 218; 304) comprises at least one detection element or marker (33; 128; 220; 306).

20 14. The diagnostic device according to claim 12 or 13, wherein said inner tube (102) has an annular groove (106) adapted to receive and draw an end of said petals (138).

15. The diagnostic device according to claim 14, wherein

said outer tube (126) has openings (134) to receive said petals (138).

16. The diagnostic device according to claim 15, wherein at an opening (134) said outer tube (126) comprises a notch 5 (136) suitable to be inserted inside an aperture (146) of a respective petal (138).

17. The diagnostic device according to claims 12 or 13, wherein said inner tube (102) has a distal grooved length (206), or a threaded length adapted to receive and draw an 10 end of a petal (230) comprising a toothed area (238).

18. The diagnostic device according to claim 17, wherein said outer tube (218) has openings (226) to receive said petals (230).

19. The diagnostic device according to claim 18, wherein 15 at an aperture (226) said outer tube (218) has presents seats (228) adapted to receive a pivot (240) of a corresponding petal (230).

20. The diagnostic device according to claim 12 or 13, wherein said petals (308) are formed as one piece with said 20 outer tube (304).

21. The diagnostic device according to claim 12 or 13, wherein each petal (308) couples with a portion of said inner tube (302) forming a unidirectional guide adapted to

close or open the petals subsequent to the translation of the inner tube relative to the outer tube and the petals.

22. The diagnostic device according to claim 21, wherein each petal (308) comprises a longitudinally extending rib 5 (310) and wherein said inner tube comprises a distal flange (312) provided with openings (314) adapted to couple with respective ribs (310) of said petals (308).

23. The diagnostic device according to claim 22, wherein said rib (310) has a T-shaped cross-section and wherein 10 said openings (314) has a C-shaped cross-section suitable to couple with the cross-section of a respective rib.

24. The diagnostic device according to one of claims 12 to 23, wherein said inner tube (12) comprises a holding body (14) arranged at a proximal end of the inner tube and 15 wherein said outer tube (28) comprises a further holding body (34) being arranged at a proximal end of the outer tube.

25. The diagnostic device according to claim 24, wherein said holding body (14) is made in the shape of a handle.

20 26. The diagnostic device according to claim 24, wherein said further holding body (34) comprises a setting ring (42) to define the position of the holding body (14) corresponding to an open configuration of the device.

27. The diagnostic device according to one of claims 24 to 26, wherein said further holding body (34) comprises at least one rib (46a, 46b, 46c) to define at least one position of the holding body (14) corresponding to an intermediate open configuration of the device.
28. The diagnostic device according to one of claims 12 to 23, wherein said outer tube (126) comprise a holding body (110) being arranged at a proximal portion of the tube, said holding body (110) comprising a first portion (112) and a second portion (114), suitable to rotate relative to the first portion, and wherein there are further comprised means for turning the rotational movement of the first portion to a translational movement of the inner tube (102).
29. The diagnostic device according to one of claims 12 to 23, wherein said outer tube (218) comprises a holding body (208) being provided with a trigger (212) adapted to rotate relative to the holding body and wherein there are provided means for turning the rotational movement of the trigger in a translational movement of the inner tube (202).
30. The diagnostic device according to claim 29, wherein said trigger (212) comprises a toothed area (216) suitable to couple with a proximal grooved length (204), or a

threaded length of the inner tube (202).

31. The diagnostic device according to claim 29 or 30, further comprising elastic means (214) being interposed between the holding body (208) and the trigger (212) to
5 withdraw the latter in the resting position.

32. The diagnostic device according to one of claims 1 to 3, wherein said means for dilating comprise arms (22) being arranged such that a first end thereof is associated with the distal end of the elongated tubular structure, said
10 arms being suitable to assume at least one closed configuration and one open configuration.

33. The diagnostic device according to claim 32, wherein at least one arm (22) comprises a straight length (22a) suitable to be fixed to the elongated structure and a
15 curved length (22b).

34. The diagnostic device according to claim 32 or 33, wherein at least one arm (22) comprises at least one detection element or marker (25).

35. The diagnostic device according to one of claims 32 to
20 34, further comprising a membrane (26) externally arranged on the arms (22).

36. The diagnostic device according to claim 35, wherein said membrane (26) is made in an elastic material.

37. The diagnostic device according to claim 35 or 36, wherein said membrane (26) is made in transparent material.

38. The diagnostic device according to one of claims 32 to 37, wherein said elongated structure comprises an inner tube (12; 102; 202) and an outer tube (28; 126; 218) adapted to internally receive said inner tube, said inner tube and said outer tube being adapted to translate relative to each other to open or close said arms (22).

39. The diagnostic device according to claim 38, wherein an outer surface of the outer tube (28; 126; 218) comprises at least one detection element or marker (33; 128; 220).

40. The diagnostic device according to claim 38 or 39, wherein an outer surface of the outer tube (12) has grooves (24) adapted to receive at least one portion of an arm (22), respectively.

41. The diagnostic device according to one of claims 38 to 40, wherein said inner tube (12) comprises a holding body (14) arranged at a proximal end of the inner tube and wherein said outer tube (28) comprises a further holding body (34) being arranged at a proximal end of the outer tube.

42. The diagnostic device according to claim 41, wherein said holding body (14) is made in the form of a handle.

43. The diagnostic device according to claim 41, wherein said further holding body (34) comprises a setting ring (42) to define the position of the holding body (14) corresponding to an open configuration of the device.

5 **44.** The diagnostic device according to one of claims 41 to 43, wherein said further holding body (34) comprises at least one rib (46a, 46b, 46c) to define at least one position of the holding body (14) corresponding to an intermediate open configuration of the device.

10 **45.** The diagnostic device according to one of claims 38 to 40, wherein said outer tube (126) comprises a holding body (110) being arranged at a proximal portion of the outer tube, said holding body (110) comprising a first portion (112) and a second portion (114) adapted to rotate relative 15 to the first portion, and wherein there are further comprised means for turning the rotational movement of the first portion to a translational motion of the inner tube (102).

20 **46.** The diagnostic device according to one of claims 38 to 40, wherein said outer tube (218) comprises a holding body (208) provided with a trigger (212) adapted to rotate relative to the holding body and wherein there are provided means to turn the rotational movement of the trigger to a

translational movement of the inner tube (202).

47. The diagnostic device according to claim 46, wherein said trigger (212) comprises a toothed area (216) adapted couple with a proximal grooved length (204), or a threaded 5 length of the inner tube (202).

48. The diagnostic device according to claim 46 or 47, further comprising elastic means (214) being interposed between the holding body (208) and the trigger (212) to withdraw the latter in the resting position.

10 49. The diagnostic device according to one of claims 1 to 3, wherein said elongated structure comprises an inner tube (12; 102; 202; 302) and an outer tube (28; 126; 218; 304) adapted to internally receive said inner tube, said inner tube and said outer tube being adapted to translate relative 15 to each other in order to open and close said means for locally dilating the walls.

50. The diagnostic device according to claim 49, wherein the outer surface of the outer tube (28; 126; 218; 304) comprises at least one detection element or marker (33; 20 128; 220; 306).

51. The diagnostic device according to claim 49 or 50, wherein said inner tube (12) comprises a holding body (14) arranged at a proximal end of the inner tube and wherein

said outer tube (28) comprises a further holding body (34) being arranged at a proximal end of the outer tube.

52. The diagnostic device according to claim 51, wherein said holding body (14) is made in the form of a handle.

5 53. The diagnostic device according to claim 51, wherein said further holding body (34) comprises a setting ring (42) in order to define the position of the holding body (14) corresponding to an open configuration of the device.

10 54. The diagnostic device according to one of claims da 51 to 53, wherein said further holding body (34) comprises at least one rib (46a, 46b, 46c) in order to define at least one position of the holding body (14) corresponding to an intermediate open configuration of the device.

15 55. The diagnostic device according to claim 49 or 50, wherein said outer tube (126) comprises a holding body (110) being arranged at a proximal portion of the tube, said holding body (110) comprising a first portion (112) and a second portion (114) adapted to rotate relative to the first portion, and wherein there are further comprised 20 means for turning the rotational movement of the first portion to a translational movement of the inner tube (102).

56. The diagnostic device according to claim 49 or 50,

wherein said outer tube (218) comprises a holding body (208) being provided with a trigger (212) adapted to rotate relative to the holding body and wherein there are provided means for turning the rotational movement of the trigger to
5 a translational movement of the inner tube (202).

57. The diagnostic device according to claim 56, wherein said trigger (212) comprises a toothed area (216) suitable to couple with a proximal grooved length (204), or a threaded length, of the inner tube (202).

10 58. The diagnostic device according to claim 56 or 57, further comprising elastic means (214) being interposed between the holding body (208) and the trigger (212) in order to withdraw the latter in the resting position.